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ABSTRACT

The Appalachian Education Satellite Project (AESP) was conceptualized in 1973 (1) to develop courses in reading and career-education instruction for teachers in the Appalachian region, and (2) to determine the feasibility of conducting such courses over a large geographical area via communications satellites. This report describes the formative evaluation design used for one course, the diagnostic and prescriptive reading instruction course for K-3 teachers. Twelve different instruments were used to evaluate the televised lecture tape, audio review tape, laboratory exercises, and scripts for the course module. Forty graduate and undergraduate students from reading classes at the University of Kentucky College of Education provided for formative evaluation data for the project. Examples of the instruments together with the specific procedures for their use are included. (DGC)

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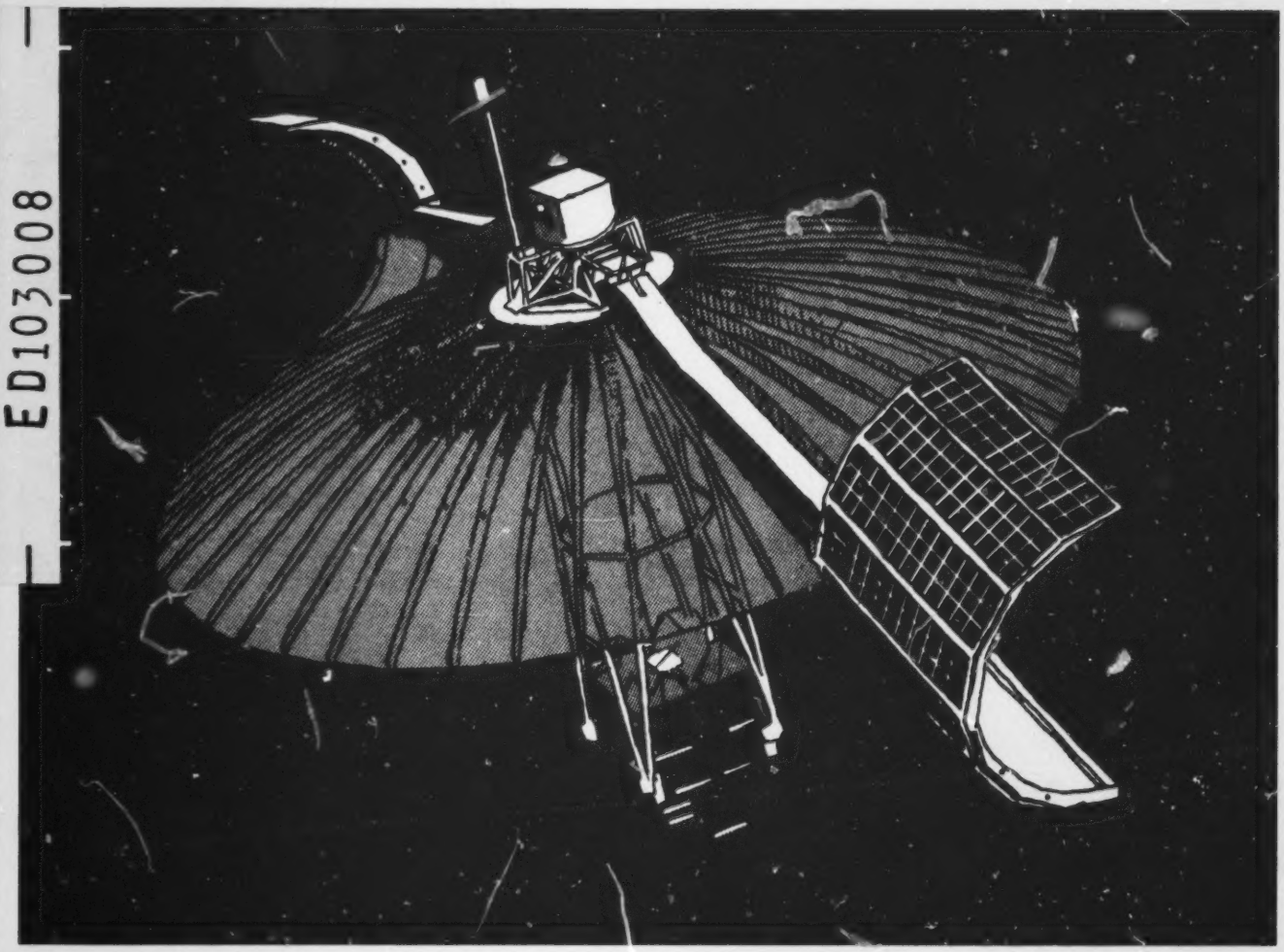

Formative Evaluation Study

appalachian education satellite project

Technical Report

number 3

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FORMATIVE EVALUATION STUDY

FOR AESP DIAGNOSTIC AND PRESCRIPTIVE READING COURSE

Prepared by

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October, 1974

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The purpose of this series is to document and disseminate information about the design, implementation, and results of the AESP experiment.

William J. Bramble and Claudine Ausness

Editors

Technical Reports #1 and #2 in this series are entitled:

AESP Data Base Information: Rationale, Data Collection Procedure, Interpretation of Results.

An Experiment in Educational Technology: An Overview of the Appalachian Education Satellite Project.

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FORMATION OF THE APPALACHIAN EDUCATION SATELLITE PROJECT

In 1966 the National Aeronautics and Space Administration (NASA) began the launching of a series of six Applications Technology Satellites (ATS). With these satellites NASA intended not only to improve satellite equipment, but also to demonstrate multiple uses of satellites. One of the 24 applications projects to which NASA allotted satellite time on ATS-6 was the Appalachian Education Satellite Project (AESP).

The AESP is a demonstration of the application of spaceage technology to education. It explores the feasibility of using satellites to deliver to classroom teachers in-service instruction and supporting information services. The demonstration requires the development of materials, procedures, and equipment suitable for the use of teachers at widely scattered learning centers in Appalachia.

During the summer of 1974 at 15 sites scattered throughout Appalachia nearly 600 teachers took either the AESP-produced elementary reading or career-education course. There were twelve instructional units in each course. The learning sequence constructed for each of these units consisted of: (1) a pre-program preparation assignment; (2) a one-half hour, pretaped televised lecture; (3) a 15-minute, question-and-answer, taped audio review on the lecture content; (4) a laboratory practice period of about 1-1 1/2 hours; (5) a homework reading assignment or activity requiring the application of the concepts and procedures, and (6) a unit test the following session that indicated to the participants how well they mastered the unit content.

To supplement the regular unit learning sequence there were 45-minute, live seminars televised four times during the courses. During

these seminars course participants at the local sites could call in questions they would like answered on the air by the content experts. To provide additional information, an on-site library and several computerized retrieval systems were made available for the use of course participants.

Rationale for the Study

Technical Report #3 describes the formative evaluation study the RCC Evaluation Component developed to assess these summer course units prior to these course units being broadcast into Appalachia. This report focuses on the application of the formative evaluation design to one unit in one of the AESP produced courses, the diagnostic and prescriptive reading instruction course (DPRI) for K-3 teachers.

The quality of course materials depends largely on the expertise of those developing the materials. However, when time and money allow, trying out preliminary materials and procedures can supply the developers with information that can be used to make decisions regarding the improvement of course materials and procedures.

To supply formative evaluation information to the developers of the instructional and evaluative materials, the RCC Evaluation Component first identified questions the developers would need answered if they were to improve their initial products:

1) How effective are the materials in teaching the behaviors specified in the unit objectives?

2) Does receiving a greater portion of the learning sequence result in the subjects learning more?

3) How do the selected formats for the learning activities compare with alternate formats for the activities in terms of their effectiveness in teaching specified behaviors?

4) Which formats for the learning activities did the subjects prefer?

5) Which type of production techniques in the televised lecture best held the interests of the subjects?

6) How does what the subjects perceived was covered compare with what the instructor intended to emphasize?

7) Is there a need to make any alterations in the evaluation procedures and instruments?

METHOD

Subjects

Volunteers were obtained from graduate and undergraduate reading classes in the University of Kentucky College of Education. Forty-one of these appeared at the designated time and place, and of these, forty actually completed the experiment. Each of the 40 subjects who participated fully in the experimental study received a gratuity of two dollars.

Table 1 summarizes the background characteristics of the 40 subjects in the study. While statistically there is no "typical"

TABLE 1

SUBJECT BACKGROUND INFORMATION SUMMARY

1. Sex: Male 2 Female 39

2. Age: Median 23 Range 20 to 60

3. Presently a Reading Teacher: No 35 Yes 6

4. Teaching Experience (Reading): None 29 1 -2 years 3
   3-4 years 5 5-10 years 3
   > 10 years 1

5. Year in School: Undergraduate: Junior 6 Senior 12
   Graduate: First year 18 Second year 2
   Other: 3

6. Highest Degree: High School 18
   Bachelor's 18
   Master's 4
   Specialist 1

7. Reading Courses (Undergraduate)

Number of Courses	Frequency
0	10
1	21
2	6
3	3
4	0
5	1

8. Reading Courses (Graduate)

Number of Courses	Frequency
0	21
1	13
2	2
3	1
4	1
5	1
6	1
7	1

TABLE 1-- CONTINUED

9. Undergraduate GPA	GPA	Frequency
	2.01 - 2.25	0
	2.26 - 2.50	5
	2.51 - 2.75	2
	2.76 - 3.00	8
	3.01 - 3.25	6
	3.26 - 3.50	12
	3.51 - 3.75	2
	3.76 - 4.00	2
	Not reported	4
10. Graduate GPA	GPA	Frequency
	2.76 - 3.00	1
	3.01 - 3.25	1
	3.26 - 3.50	3
	3.51 - 3.75	2
	3.76 - 4.00	10
	Not reported	24
11. GRE Verbal	Score	Frequency
	301 - 350	2
	351 - 400	2
	401 - 450	5
	451 - 500	5
	501 - 550	4
	551 - 600	0
	601 - 650	0
	651 - 700	0
	701 - 750	1
	Not reported	22
12. GRE Quantitative	Score	Frequency
	351 - 400	7
	401 - 450	3
	451 - 500	5
	501 - 550	2
	551 - 600	1
	601 - 650	0
	651 - 700	1
	Not reported	22

subject, the data in Table 1 suggest that the subject tended to be a woman, 23 years old with a B grade-point-average who scored average or below on the Graduate Record Examination. She was working on her bachelor's or master's degree, had had little or no actual experience in teaching reading, and had completed one course in reading instruction.

Instructional Materials

The instructional materials needed to implement the study were: (1) a copy of the 30-minute televised lecture tape; (2) a copy of the 15-minute audio review tape; (3) a copy of the laboratory materials; (4) a printed copy of the videotape script; and (5) a printed copy of the audio review script.

Videotape #5

Videotape #5 is one of the 12 televised lectures to be broadcast as part of the diagnostic and prescriptive reading instruction (DPRI) course for K-3 teachers. The instructional activities in Unit 5 focus on the analysis of oral reading miscues, as presented by Yetta Goodman and Carolyn Burke in their Reading Miscue Inventory Manual: Procedures for Diagnosis and Evaluation (New York: MacMillan, 1974).

In format the videotape is best characterized as an illustrated lecture. It consists structually of an opening and closing that shows a redheaded, freckled-faced Appalachian boy having difficulty reading, on-and-off camera narration by the instructor on the procedures for

administering and interpreting the Reading Miscue Inventory (RMI), graphic illustrations of the RMI procedures, and documentary film segments that depict the RMI being administered to an elementary student and scored by a teacher.

Audio Review Tape #5

Audio review tape #5 is one of the 12 four-channel-audio review tapes to be broadcast as part of the DPRI course. It contains four case-study type questions that either highlight some of the main concepts presented during the televised lecture or make explicit classroom implications of these concepts.

During the actual course, the four questions and responses were transmitted on four audio channels, one channel for each alternative response. The participants listened to the four-choice audio review questions on a set of headphones. The participant then pressed the button on his response pad corresponding to his chosen response (A, B, C, or D). Immediately following his selection he heard an explanation that gave him feedback on the correctness or incorrectness of his response. Since the next question he heard was unrelated to his response on the previous question, there was branching within a question but not between questions.

To simulate for the 7-group study, the simultaneous broadcast via satellite of four explanations, a four-track tape was produced. It contained the questions, alternatives, and alternate explanations. With this recording and the headphones and playback equipment in the UK language laboratory, the subjects in the 7-group experiment were able to

go through a selection process similar to the one the participants in the course followed when the actual four-channel audio equipment was used.

Laboratory Materials for Unit 5

Like the participants in the course, the subjects in one of the 7 groups received a copy of the DPRI ancillary activities guide for Unit 5. The guide included blank and filled-in copies of the RMI worksheet, a retelling outline, coding sheet, and reader profile. The DPRI instructor, playing the role of the site monitor, guided the subjects through the activities outlined in the ancillary activities guide. The subjects listened to a tape of a child reading, marked his miscues on the worksheet and his comprehension remarks on the retelling sheet, and filled in the coding sheet and the reader profile. The attempt again was to recreate for the 7-group subjects the environment the actual course participants experienced.

Printed Videotape Script

Some minor changes in word choice were made in the 19-page script to adapt the narration to a written rather than an audio-visual medium, but the essential content of the script was unaltered. For instance, the alteration in delivery mode made it necessary to make references to pictured materials more descriptive. The appendix to this modified videotape script included some of the materials displayed visually during the videotaped administration of the RMI. The appendix contained a copy of the boy's worksheet with all the miscues written in and such sections of the RMI manual as the coding sheet, the reader

profile, and the patterns for interpreting student use of grammatical and comprehension clues.

Audio Review Script #5

The printed audio review script for reading Unit 5 is a verbatim transcription of the questions, alternatives and explanations that appear on the four-channel audio tape #5. Each question with its alternatives appeared on a separate page, the next two pages listing the four possible responses, with each response followed by its particular explanation.

Even though the content is the same, the printed format made this a different learning activity from that experienced by a student who heard the questions and answers. Consequently the instructions to the subjects differed: the subject was asked to read each question, circle the answer he felt was best, turn the page and read the explanation for that alternative, and move on to the next question. As in the audio format, a brief summary of the main concepts discussed in the questions appeared at the end of the printed review.

Evaluation Instruments

To illuminate the purpose and content of each of the 12 different evaluation instruments used in this study, the instruments are grouped by the type of information they supply.

Educational Value of Materials

Since the learning sequence for the summer courses included

the televised lecture, the audio review, and the laboratory activities, the following four instruments were developed to measure the effectiveness of the instruction.

Unit Test #5: The test consisted of 24 multiple-choice items each with 4 alternatives. These items allowed the subjects to demonstrate whether they could perform the behaviors specified in the seven objectives for reading Unit 5. Table 2 lists the unit objectives.

TABLE 2

UNIT 5 READING OBJECTIVES

1. The student can recognize the activities involved in administering the Reading Miscue Inventory (RMI).
2. The student can recognize the activities involved in constructing the RMI.
3. The student can record and translate miscues recorded on the RMI worksheet.
4. The student can record information on the RMI coding sheet.
5. The student demonstrates a sophisticated attitude towards oral reading miscues.
6. The student can interpret results from the RMI.
7. The student can prescribe appropriate remedial exercises for problems detected by the RMI.

There were three items on the test that measured each objective, except objective 6 for which there were 6 items.

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Reading Attitudes Test: The test consisted of 28 statements about reading instruction procedures, some consistent and others inconsistent with the DPRI approach. In the instructions at the top of the form the subject was requested to respond to each statement by marking on the separate answer sheet the number on a five-point Likert scale that best characterized his attitude. The options were: (1) strongly agree; (2) moderately agree: (3) neutral; (4) moderately disagree, and (5) strongly disagree.

Since the subjects in this experiment were exposed only to materials in Unit 5, alterations in attitudes were not expected to be as extensive as when participants were exposed to all 12 units. To provide an index of the affective impact of Unit 5, items that covered Unit 5 were analyzed separately. Table 3 lists the 8 out of 27 statements in the attitude questionnaire that the content of Unit 5 explicitly or inferentially supported or disavowed.

TABLE 3

ITEMS IN COURSE ATTITUDE QUESTIONNAIRE COVERED IN UNIT 5

1.	Students should orally read every word correctly.
2.	A student should be corrected when he makes any mistake.
3.	One should be more interested in a child accurately telling what a story is about than his reading the story aloud with making miscues.
4.	An analysis of oral reading miscues is more trouble than it's worth.
5.	There's not much sense wasting time diagnosing reading problems.
6.	Diagnosing student reading problems should be left to the counselor.
7.	I believe in individualized diagnosis and instruction.
8.	Reading is reconstructing meaning from the written page.

Unit Objective Rating Form: Listed on this form were seven objectives for reading Unit 5 plus three bogus objectives. The subjects were asked to rank ten objectives from one to ten in terms of the perceived emphasis on the objective received during the instructional activities, with a rating of one for the objective that received the most emphasis.

Confidential Background Questionnaire: The questionnaire consisted of 10 fill-in-the-blank and 5 multiple-choice items. It provided information on such individual differences of the subjects as their sex, age, education level, formal learning experiences in reading, teaching experience in reading instruction, graduate and undergraduate grade-point-average, and GRE scores. With this information it was possible to relate background characteristics to performance and to determine with which types, if any, the materials were most effective.

Subject-Perceived Quality of Materials

Measuring the degree to which cognitive and affective changes occur in the participants is one way to evaluate the effectiveness of the materials. Another method is to have the users of the materials express their opinion of the quality of the materials. To obtain this information an attitudinal instrument for each of the six learning activities was developed. Each instrument collected information on the perceived usefulness of the content to the classroom teacher, the perceived technical and presentation quality of the materials and equipment used during the activity, and the preferences of the subjects for various presentation modes.

Table 4 identifies the technical, presentation, content, and value features common to all three types of learning activities rated by the subjects. For instance, in the value section of Table 4 are seven features the subjects were asked to rate. There is an X under the format if the feature was rated. For instance, the subjects in all formats were asked to rate how interesting the different formats for each instructional activity were (feature 19) and how much they felt they learned during the activity (feature 20).

The data gathered on the six attitudinal instruments provided information that could be used to answer such questions about the acceptability of the materials, the equipment and the procedures as:

- Does the equipment malfunction or some mishandling of the class interfere with the reception of the instruction? (see technical features in Table 4).

- Are the materials adequately displayed and does the presenter speak distinctly and seem credible? (see presentation features in Table 4).

- Are the ideas presented in an organized fashion, and is the information adapted to the needs of the classroom teacher? (see content features in Table 4).

- What is the value of the presentation as an instructional activity? (see value features in Table 4).

TABLE 4

PRESENTATION FEATURES OF THE LEARNING ACTIVITIES RATED BY SUBJECTS

Features	Instruction			Review		Ancillary Activities
	Television	Lecture	Script	Taped	Written	
Technical						
1. Satisfactory learning conditions	X	X	X			X
2. Satisfaction with volume level	X	X		X		X***
3. No difficulty in seeing delivery vehicle	X	X			X	X
4. Ease of equipment or format use	X			X*	X	
Presentation						
5. Adequate display of materials	X	X			X	X
6. Value of supplementary charts and pictures	X	X	X	X	X	X
7. Overly complex presentation	X	X	X	X	X	X
8. Overly simple presentation	X	X	X	X	X	X
9. Enthusiasm of presenter	X	X	X	X		X
10. Clarity of instructor's enunciation	X	X	X	X		X
11. Naturalness of speaker's voice	X	X		X		
12. Non-condescending tone	X	X		X**		X
13. Satisfaction with speed of presentation				X	X	
14. Clarity of materials						

*6 Items
**7 Items
***2 Items
****3 Items

TABLE 4 -- CONTINUED

Features	Instruction			Review		Ancillary Activities
	Television	Lecture	Script	Taped	Written	
Content						
13. Cohesiveness of content organization	X	X	X			X
14. Relating of ideas to examples	X	X	X			X
15. Tendency to digress	X	X	X			X
16. Adequacy of concept amplification	X	X	X	X	X	X
17. Overly difficult content	X	X	X			X
18. Overly simple content	X	X	X			X
Value						
19. Capability of materials to hold attention	X	X	X	X	X	X
20. Instructional value of activity	X	X	X			X***
21. Preference for activity over watching TV				X	X	X***
22. Rating of TV content as more informative than activity				X	X	X***
23. Value of activity relative to time				X	X	X****
24. Preference for audio review to laboratory activities				X		X
25. Rating of audio review as more informative than laboratory				X		X
Total Items on Questionnaire	20	19	15	27	12	29

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The Video, Lecture and Script Questionnaires: These were three separate, but essentially parallel, instruments that measured the opinions of the subjects on the content and presentation quality of three different modes of instruction. The rewording of items to describe the particular mode was one of the minor differences between the questionnaires. For instance, whether a reference was made to the "TV program" or the "lecture" or the "script" depended on the presentation mode. Since all items did not apply to all three presentation modes, the questionnaires also differed in length. The Video Questionnaire had 20 items, the Lecture Questionnaire had 19 and the Script Questionnaire had 15. The subject rated each statement on a five-pcint Likert scale.

The Four-Channel Audio Rating and the Four-Channel Audio Script Rating Form: These were separate but parallel forms that measured the opinions of the subjects on the content and presentation quality of the taped and written formats for the review and amplification of the instruction. The qualities of the taped and written reviews were stated in question form and required a dichotomous yes-no response.

Table 4 identifies which features common to both modes of review were assessed by the items. Summing the scores and comparing the means for the items common to each format provided a measure of subject receptivity to the different ways of presenting the same material.

Ancillary Activities Questionnaire: As revealed in Table 4 many of the 29 Likert-type statements on this form allowed the subjects not only to express their opinions of features peculiar to the

laboratory activities but also to compare the relative value of the televised lecture, the audio review and the laboratory as an instructional activity. Since the subjects in only one group received the three-part learning sequence that the actual course participants received, only they could make comparisons between these learning activities.

Audience Reaction Form: This form collected information on the preferences of the participants for the different presentation methods and topics covered during the Unit 5 televised lecture. It consisted simply of the statement "I liked this portion" of the videotape repeated 15 times with each statement followed by a five-point Likert scale labeled "Strongly Agree" (5) at one end and "Strongly Disagree" (1) at the other end.

Procedures

On April 10, 1974, all the subjects gathered in one room to hear again the reasons for the study and to receive a packet containing all the evaluation and instructional materials they would need. A group number and a room number were written on the front of each packet, and the packets were randomly ordered. When the subjects picked up a packet they thereby knew which group they were in and where to report to begin their activities.

Table 5 depicts the learning activities each group received before they were given the unit test. As shown in Table 5 three of the groups received varying portions of the instructional sequence that the

summer course participants actually received. Group 7 received the entire instructional sequence - the televised lecture, followed by the audio review with immediate feedback and the laboratory activities. Group 6 received the televised lecture followed by the audio review, and Group 4 received only the televised lecture.

In contrast, three of the groups received the lecture or the review in an alternate delivery mode. Group 2 received a written version of the lecture, and Group 3 heard an on-site instructor deliver a fifty-minute lecture. The lecture covered essentially the same material covered in the televised lecture. Group 5 received the regular televised lecture, but a paper and pencil, rather than an audio, version of the review questions. To estimate entrance-level knowledge, Group 1 received no treatment.

TABLE 5

CONTRASTING LEARNING SEQUENCES FOR GROUPS

Treatment	Instruction			Review		Laboratory Activities	Unit Test
	Televised	Live	Written	Audio	Written		
Group 1							X
Group 4	X						X
Group 3		X					X
Group 2			X				X
Group 6	X			X			X
Group 5	X				X		X
Group 7	X			X		X	X

In addition after Group 1 took the unit test, the members of the group were asked to watch the televised lecture. Each time a bell rang, they were asked to mark on a five-point Likert scale the point that best characterized their response to the statement, "I liked this portion" of the videotape. The bell rang at the end of each of 15 preselected segments of the televised lecture.

The monitor for each group received a time schedule that supplied administration instructions. Table 6 summarizes the instructional and evaluative activities the monitor had each group perform. For instance, Group 1, the control group filled out only the Confidential Background Questionnaire before they took the unit test. Then, they marked the Audience Reaction formats as they watched the televised lecture. After the video lesson they rated the quality of the televised lecture (VQ) and ranked the unit objectives (UOR).

RESULTS AND DISCUSSION

The results of the study have been organized according to the research questions the study was designed to provide information on.

1) How effective are the materials in teaching the behaviors specified in the unit objectives?

Table 7 lists the unit test means and standard errors for the seven groups in the study. The means are depicted graphically in Figure 1. Group 1, those who received none of the planned learning sequence, had the lowest observed unit test mean. What this suggests

TABLE 6

INSTRUCTIONAL AND EVALUATIVE ACTIVITIES OF SEVEN GROUPS

Activity	Group	1	2	3	4	5	6	7	Total Number
	Size*	9	6	5	6	5	5	4	40
Fill out CBQ		X	X	X	X	X	X	X	40
Watch videotape lesson					X	X	X	X	20
Read lesson script			X						6
Hear lecture on lesson				X					5
Rate videotape on VQ		X			X	X	X	X	24
Rate lesson script on SQ			X						6
Rate lecture on LQ				X					5
Perform taped review exercise							X	X	9
Perform written review exercise						X			5
Rate taped review on FCARF							X	X	9
Rate written review on FCASR						X			5
Perform lab activities								X	4
Rate lab activities on AAQ								X	4
Rank unit objectives on UOR form		X	X	X	X	X	X	X	40
Take reading attitudes test			X	X	X				17
Take unit test		X	X	X	X	X	X	X	40
Watch 2nd run of videotape		X							9
Fill out audience reaction form		X							9

*Number of subjects in group

is that the instructional materials in the course do assist in the acquisition of the behaviors specified in the unit objectives.

TABLE 7

GROUP MEANS AND STANDARD ERRORS FOR SEVEN-GROUP EXPERIMENT

Group	Description	Mean	S.E.	n
1	Posttest	13.89	3.30	9
2	Script, Posttest	16.83	1.72	6
3	Lecture, Posttest	16.80	3.96	5
4	Video, Posttest	17.83	2.48	6
5	Video, 4-C Script, Posttest	16.20	1.92	5
6	Video, 4-C Audio, Posttest	17.40	2.07	5
7	Video, 4-C Audio, Lab, Posttest	17.50	1.73	4

The group 1 mean, 13.89, was much higher than would be expected by chance. Since there were 24 four-alternative, multiple-choice items on the unit test, a mean on the unit test of approximately six would be expected if the subjects were not at all knowledgeable about the item content and responded randomly to all items. There are at least two possible explanations for this unusually high mean for the control group. First, most of the subjects were currently enrolled in a reading course or had taken reading courses previously and all the subjects received a copy of the RMI manual a week prior to participating in the experiment for pre-program preparation. Secondly, the unit test

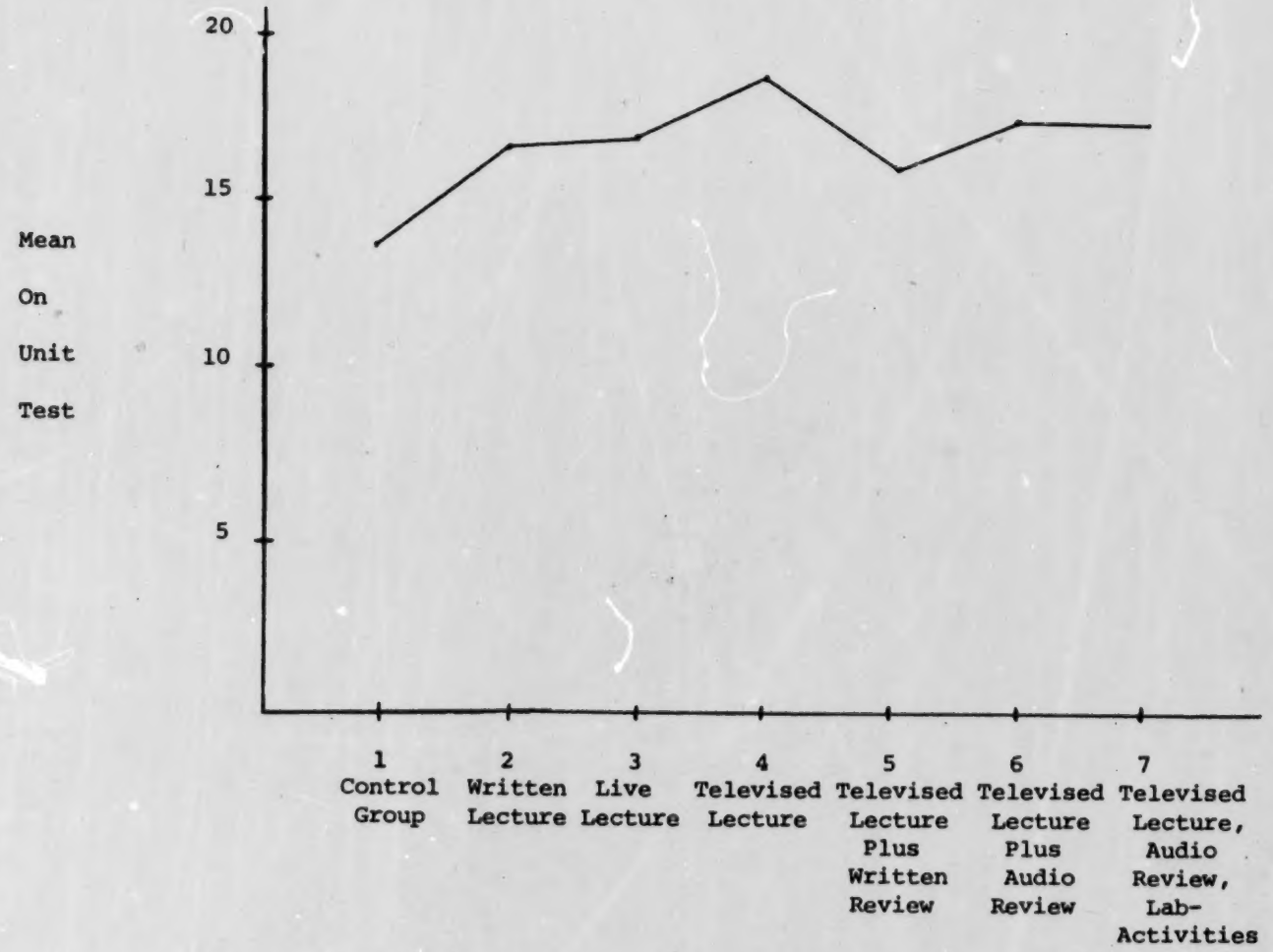

FIG. 1 -- MEANS OF SEVEN-GROUP EXPERIMENT FOR UNIT TEST ON THE READING MISCUE ANALYSIS

was apparently rather easy, perhaps reflecting the low level cognitive objectives stated for the unit. The difficulty indices listed in Table 8 suggest some of the unit test items were too easy.

TABLE 8

ITEM ANALYSIS FOR UNIT TEST[1]
GROUPS 1-7

Test Item #	Objective #	Easiness	Biserial Correl. With Total Test Score	Reliability Index
1	4	.175	.22	.09
2	2	.825	.60	.23
3	2	.700	.55	.25
4	3	.900	.58	.17
5	3	.900	.22	.07
6	[illegible]	.750	.13	.06
7	[illegible]	.950	.40	.09
8	4	.475	.29	.15
9	7	.125	.01	.00
10	5	.550	.33	.16
11	6	.125	.28	.09
12a	3	1.000	.00	.00
12b	3	.975	.19	.03
12c	3	.850	.65	.23
12d	3	.850	.65	.23
13	1	.575	.07	.04
14	7	.350	-.02	-.01
15	1	.675	.32	.15
16	6	.950	.40	.09
17	7	.525	.37	.18
18	5	.950	-.01	.00
19	1	.550	.36	.18
20	4	.850	.13	.05
21	2	.775	.54	.22

[1] Test reliability is .582 by KR-20, test mean is 15.35, and test standard deviation is 2.81. Reliability and test mean are estimated for subjects in groups 1-7 and omitting item 12a. Number of subjects was 40.

While the unit test measured cognitive achievement, the reading attitudes questionnaire measured the attitudes of the subjects toward principles expressed in Unit 5. As indicated in Table 3 there were eight items on the attitude test related to concepts covered during Unit 5. The means have been adjusted so that the closer a mean is to five the more strongly the subjects agreed with the principle.

The means for the 17 subjects taking this test (groups 2, 3, and 4) were (1) 4.47 (SD .62) for the idea that it is not important that children make no errors while reading aloud; (2) 4.06 (SD 1.09) for the idea that it is not necessary to correct a child every time he makes a mistake; (3) 4.47 (SD .80) for the idea that it is more important that a child understands what he reads than read without making miscues; (4) 4.29 (SD .85) for the idea that analyzing oral miscues is worth the time it takes; (5) 4.94 (SD .24) for the idea that diagnosing reading problems is worth the time it takes; (6) 4.82 (SD .53) for the idea that diagnosing reading problems is the responsibility of the teacher rather than the counselor; (7) 4.82 (SD .39) for the idea that individualized diagnosis and instruction is important; (8) 4.35 (SD .61) for the notion that the main function of reading is the reconstruction meaning from written symbols.

The subjects on the average expressed a very positive attitude toward the principles expressed in the unit. Since the attitude questionnaire was only given to students receiving the lecture in some format, it was not possible to measure changes in attitudes as a result of the lecture nor to compare the results for students participating in the other learning activities.

2) Does receiving a greater portion of the learning sequence result in the subjects learning more?

The increments in learning attributed to different amounts of the learning sequence and learning activities were estimated by comparing the group means. The model, $Y_i = \mu + \theta_1 + \theta_2 + \theta_3 + e_i$, depicts the learning increments due to each learning activity. In this model Y_i is the unit test score for subjects i completing all learning activities, μ is the population grand mean without instruction, θ_1 is the effect of the televised or written lecture, θ_2 is the effect of the taped or written review activity, θ_3 is the effect of the laboratory materials, and e_i is the error term for subject i.

To estimate these effects, the model used is

$$Y_i = \bar{Y}_n + (\bar{Y}_I - \bar{Y}_n) + (\bar{Y}_F - \bar{Y}_I) - (\bar{Y}_L - \bar{Y}_F) + e_i,$$

when $\bar{Y}_n$ is the estimated mean for students receiving no instruction, $\bar{Y}_I$ is the mean for those receiving only the initial lecture instruction in some format, $\bar{Y}_F$ is the mean for subjects receiving the lecture and the review in some format, $\bar{Y}_L$ is the mean for students receiving the laboratory activities and the lecture and review in the format selected for the summer courses. When the estimates are used in the model, it becomes

$$Y_i = 13.89 + 3.26 + (-.35) + .70 + e_i .$$

Of all the planned comparisons only the effect of the lecture in some format ($\hat{\theta}_1 = 3.26$) was significantly different from zero ($\alpha = .05$).

This means that the only learning detectable, with this design, sample size, and measuring instrument, resulted from the presentation of the lecture in some format. The fact that subjects who received

more of the learning sequence did not show significant gain may be due to memory loss or retroactive inhibition (subsequent learning interfered with prior learning).

3) How do the selected formats for the learning activities compare with the alternate formats in terms of their effectiveness in teaching specified behaviors?

Comparisons were made among the alternative formats for the lecture presentation (live lecture, television script only, and televised lecture) and between the formats for the audio review (pretaped audio review and audio review script only) using the Scheffé method for a posteriori comparisons. The dependent variable was the unit test score. None of these tests were significant for the sample sizes employed. Thus, no detectable differences in unit test performance as a function of alternative presentation formats were observed.

4) Which formats for the learning activities did the subjects prefer?

By their unit test scores the subjects demonstrated the general effectiveness of the materials and procedures. In addition, their opinions about the quality of the materials and the acceptability of the procedures and equipment provided an index to the effectiveness of the individual learning activities.

On the questionnaires developed for each activity the users were asked to express their opinion about different features of the learning

activities. Those watching the televised lecture were asked to respond to the statements on the Video Questionnaire, those listening to the live lecturer were asked to rate the statements on the Lecture Questionnaire, and so forth. The statements cluster around four basic aspects of each learning activity: technical, presentation, content, and over-all value features of the activity.

The independent variable, then, is the learning activity the subject experienced, and the dependent variable is the subject's score on the questionnaire appropriate for the activity. The length of these questionnaires differed, since different learning activities or alternative formats for the same learning activity occasionally called for more information on one or more of the four feature categories. For instance, the Four-Channel Audio Rating form is much longer than the Four-Channel Script Rating form partially because it contains more statements about technical features. However, when different formats for the same learning activity were compared, only items common to all questionnaires were included in the total scores. From the data collected several interpretations can be made about subject preferences.

a) The data suggest that the users preferred the live to the televised or written versions of the lecture.

Table 9 lists the individual item means for the different features the subjects assessed on the questionnaires for the three lecture formats -- the televised lecture, the live lecture, and the written lecture. It should be pointed out that, although the features

TABLE 9

USER ATTITUDES TOWARD THE LECTURE LEARNING ACTIVITY

Features	Televised n = 29		Live n = 5		Written n = 6	
Technical	Mean Response	Standard Error	Mean Response	Standard Error	Mean Response	Standard Error
*1. Satisfactory learning conditions in room	4.03	.18	5.0	0	3.5	.34
*2. No difficulty in seeing delivery vehicle	4.47	.13	4.8	.20	4.2	.17
3. No distortion of picture	4.37	.14				
Presentation						
4. No difficulty seeing items displayed	4.23	.17	4.2	.58		
5. No difficulty hearing presenter	4.37	.12	4.8	.22		
*6. Chart and art displays made lecture more understandable	4.13	.13	4.6	.26	2.7	.42
*7. Not overly complex presentation	4.00	.14	4.4	.25	3.7	.21
*8. Not overly simple presentation	4.26	.10	4.4	.25	3.8	.17
*9. Sufficiently enthusiastic presenter	4.07	.11	4.8	.20	3.8	.17
*10. Presenter's enunciation clear	4.20	.15	4.8	.20	4.0	.26
11. Presenter's voice not monotonous	3.97	.14	4.8	.20		
12. Presenter's tone not condescending	4.00	.16	4.4	.25		

TABLE 9 -- CONTINUED

Features	Televised n = 29		Live n = 5		Written n = 6	
Content	Mean Response	Standard Error	Mean Response	Standard Error	Mean Response	Standard Error
*13. Content well organized	4.47	.09	4.8	.22	3.9	.40
*14. Adequate relating of concepts to examples	4.27	.11	4.6	.25	3.7	.34
*15. No tendency to digress	4.23	.14	4.6	.25	4.2	.17
*16. Sufficient amplification of each point	3.63	.16	4.6	.25	3.5	.34
*17. Material not too difficult	4.00	.12	4.2	.20	3.8	.17
*18. Material not too easy	4.23	.08	4.2	.20	4.0	.26
Value						
*19. Lecture capable of holding attention	3.33	.19	4.6	.25	3.5	.34
*20. Lecture taught a lot	3.80	.15	4.4	.25	4.0	.26
Total Items On Questionnaire	20		19		15	

*Features included in the total scores for comparisons between formats.

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are now stated positively for greater readability, on the questionnaires the statements were phrased in both positive and negative directions. The closer the mean is to 5 in Table 9 the more positive user reaction was.

The starred features identify the 15 items on the questionnaires for the three alternate lecture formats that were included in the total scores used to compare the reactions of the subjects to each lecture format. The unstarred features specify what kinds of additional information about particular lecture formats were collected.

In Table 10 are the results of the analysis of variance performed on the total scores. These total scores are the sum of the 15 parallel items on the questionnaires filled out by the three groups who received different formats for the lecture. The obtained F was 8.17 with 2 and 38 degrees of freedom. The F was significant at the .002 level. This indicates that there is a difference in user attitudes toward one or more of the different lecture formats.

TABLE 10

ANALYSIS OF VARIANCE FOR WRITTEN, LIVE, AND TELEVISED LECTURES

Source	SS	df	MS	F	p
Between	440.120	2	220.060	8.173	.002
Within	1023.100	38	26.924		
Total	1463.220	40			

The obtained mean for the live lecture format was 68.80 (n=5); for the televised lecture format, 61.13 (n=30); for the written lecture format, 56.17 (n=6). Pairwise comparisons of these means were made using the Scheffé tests for a posteriori comparisons. The Scheffé tests revealed that the written and live lecture means were significantly different at the .01 level, and the live lecture and the televised lecture means were significantly different at the .01 level. The televised lecture and the written lecture means were not significantly different, although the probability level was just greater than .1.

Since only one of the features evaluated (see Table 9) received a rating of less than 3 on a five-point scale, the subjects on the average viewed positively most of the features of the lecture learning activity, regardless of format. Simple t tests were run on the item means for the individual features to find out which differences among the groups were significant. Since running this large a number of tests compounds the type I error, this part of the analysis was clearly exploratory in nature, useful in the sense of providing directions for product improvement and further research. These tests revealed that those participating in alternate formats of the lecture differed significantly in their attitude toward the following features.

There was a significant difference at the .05 level between the television vs. live lecture and the live lecture vs. written lecture groups in their satisfaction with the learning conditions, feature 1 in Table 9. Those reading the lecture or watching the televised lecture were less satisfied than those hearing the live lecture. It might be

logically interpreted, one caution about interpreting the data needs to be made before preceding: It is highly likely that the subjects rated the television presenter in relation to other television hosts and the classroom presenter in relation to other classroom teachers. Consequently, unless television hosts and classroom teachers are equally effective in presenting material and selling themselves, the results, based on different standards of excellence, may not be comparable. For this reason, it can only be stated with caution that the subjects seemed to prefer the live to the televised presenter. The live lecture group differed significantly from the television lecture group on features 9 and 10 at the .05 level and on feature 11 at the .10 level.

The subjects rating the television lecture felt the television presenter's voice was more monotonous, his enunciation less clear, and his enthusiasm less genuine than the subjects rating the live presenter. Since the same person was the live and the televised instructor, these differences in perception may mean that the instructor, a university professor, either felt more comfortable in the role of an on-site instructor or the subjects, university students, felt more comfortable with the live lecturer. It may be that for a person who is not a professional actor "just talking" rather than reading a teleprompter is an easier thing to do naturally.

The significant difference between the live and the written lecture groups at the .01 level for presentation feature 8 can best be described in relation to the significant difference at the .01 level

that environmental imperfections, such as stray noises or uncomfortable seating, tended to be more distracting when the activity demanded more concentration on the part of the subject or when the activity failed to engage the attention of the subject.

There were five different presentation features toward which one or more of the lecture groups differed significantly in their attitude. The television vs. written and the live vs. written lecture groups differed significantly at the .05 level in their attitude toward the quality of the art displays, feature 6 in Table 9. The subjects felt both the live and the televised lectures displayed material in an easier to understand manner. Probably the written lecture group found the xeroxed supplementary tables less helpful than either the professionally designed art exhibits displayed on television or the material displayed on the overhead projector and explained by the live instructor.

The television vs. live lecture and the live vs. written lecture groups differed significantly in their attitudes about the quality of the presenter's delivery, features 9, 10 and 11 in Table 9. It is questionable whether features 9 and 10 for the written lecture group really make sense or are comparable with the parallel items for the live lecture. It is difficult to see how a xeroxed lecture can convey enthusiasm in the same way a speaker can or how writing clearly can be equated with speaking clearly, the latter feature having more to do with enunciation than clarity.

While the differences between the television and live lecture groups in their attitudes toward the person presenting the materials can be

between these two groups for content features 13, 14 and 15. Those reading the lecture were significantly less satisfied with the organization, (feature 13), concreteness, (feature 14), and amplification of each point (feature 16), than these hearing the live lecture. For these reasons, they may have felt the presentation was less simple to understand (feature 8).

In addition, the television lecture group also differed significantly from the live lecture group on feature 16, having to do with sufficiency of amplification. It is easy to understand how the live lecturer may have the advantage over any fixed presentation, either televised or written, in amplification, since he can expand any point that he perceives the class does not understand. What is more difficult to understand is why the live lecture and not the televised lecture significantly differed from the written lecture in adequacy of content organization and exemplification, since the televised lecture showed actual demonstrations of the materials being used in real classrooms.

The television vs. live and the live vs. written lecture groups differed significantly at the .05 level in their opinions of the attention-holding value of the lecture activity. For whatever reason, the live lecturer was better able to hold student attention than the written text or the television program. Explanations for this can be hypothesized from previous reactions of the subjects on the questionnaires: they perceived the live presentation as more natural

(feature 11); they found the room more acceptable as a learning environment for more traditional teacher-student interaction (feature 1); eye contact between students and teacher made possible the adapting of the presentation to the immediately perceived needs of the particular class (feature 16).

Those in the live lecture group also rated the instructional value of the lecture significantly higher at the .05 level than those in the televised lecture group. It may be that the subjects felt the half-hour television lecture, in comparison to the 50-minute live lecture, carried them through the material too rapidly. However, in terms of the ability actually to perform the behaviors specified in the objectives, as tested by the unit test, the televised lecture, written lecture, and the live lecture groups did not differ significantly in the scores they made.

b) The data suggest that the users found the written and the audio formats for the review equally acceptable.

Table 11 lists the individual item means for the different features assessed by the subjects on the questionnaires for the two review formats -- the audio review and the written review. Although the features are all stated positively for ease in reading, the statements were phrased in both positive and negative directions on the original questionnaires. The item responses were dichotomous. The closer the mean is to 2 the more positive user reaction was.

The starred features identify the 10 items on the questionnaires for the two alternate review formats that made up the total scores used to compare the reactions of the subjects. The unstarred features specify the kinds of additional information particular to the format that were collected. For instance, the questionnaire for the audio review was much longer than that for the written review, because it included statements about the functioning of the audio equipment, the timing of the questions and answers, and the quality of the oral presentation.

To determine whether the groups differed in their over-all reaction to the alternate review formats, a t test was performed on the total scores for the 8 subjects in the audio review and the 5 subjects in the written review groups. The total score was made up of the 10 features common to both formats. The obtained t value was -1.37, which with 11 degrees of freedom was not significant. The estimated mean for the written review was higher, but this difference was not significant. Insofar as this sample size allows for adequate hypothesis testing no evidence was found that user satisfaction with the review activity depends on presentation mode.

Since only four of the features evaluated (see features 2, 22, 26, 28 in Table 11) received a rating of less than 1.5 on a 2-point scale, the subjects, on the average, viewed positively most of the features of the review learning activity, regardless of format. By looking at each of these negative assessments, potential problem areas were identified. It is not necessary to be concerned about the extreme

TABLE 11

USER ATTITUDES TOWARD THE REVIEW LEARNING ACTIVITY

Features	Audio Review (n = 8)		Written Review (n = 5)	
Technical	Mean** Response	Standard Error	Mean** Response	Standard Error
1. Audio reception without noise distortion	1.9	.12		
2. Appropriate volume level	1.1	.12		
3. Hearing only one answer at a time	1.7	.15		
4. Answer completed before next question	1.9	.12		
5. Reception of answer selected	2.0	0		
6. Equipment easy to use	1.9	.12		
7. No trouble seeing the questions and answers			1.8	.20
Presentation				
8. Sufficient time to put headset on	2.0	0		
9. Sufficient time to answer question 1	2.0	0		
10. Sufficient time to answer question 2	2.0	0		
11. Sufficient time to answer question 3	2.0	0		
12. Sufficient time to answer question 4	2.0	0		
13. Like speaker's voice	1.6	.17		
14. Speaker's enunciation clear	1.9	.12		
15. Naturalness of speaker's voice	1.5	.18		
16. Not speaking too fast	1.9	.12		
17. Not speaking too slow	2.0	0		
18. Speaking at appropriate speed	1.9	.12		
*19. Vocabulary not too simple	2.0	0	2	0
*20. Vocabulary not too hard	2.0	0	2	0
*21. Appropriate vocabulary level	2.0	0	2	0
*22. Clarity of questions	2.0	0	1.4	.20
*23. Clarity of explanations	1.9	.12	2	0
24. No trouble using the question-answer format			2	0

TABLE 11 -- CONTINUED

Features	Audio Review (n = 8)		Written Review (n = 5)	
Content	Mean** Response	Standard Error	Mean** Response	Standard Error
*25. Thoroughness of explanation	1.9	.12	2	0
*26. Interestingness of explanation	1.4	.17	2	0
Value Comparisons				
*27. Make lecture more understandable	1.6	.17	1.8	.20
*28. Preference for review activity over watching TV lecture	1.3	.16	1.4	.26
*29. Review worth the time	1.6	.17	2	0
Total Items on Questionnaire	27		12	

*Common items

**The closer to 2 the more positive the response.

dissatisfaction the subjects hearing the review felt about the volume level (feature 2 in Table 11). The actual four-channel equipment to be used during the summer of 1974 has individual volume controls. However, it is important to keep in mind that, if the subjects were extremely annoyed by a technical imperfection that interferred with their reception of the information, they could rate other features of the activity lower than they otherwise would.

Simple t tests were run on individual feature means for the two review formats in order to find out which means were far enough apart to be significantly different. Feature 22 was significantly different at the .05 level. While the audio review group unanimously felt the questions were clear, the written review group using the printed question format was significantly more dissatisfied with the clarity of the questions (feature 22). The data do not indicate whether this reaction to the questions stemmed from their phrasing, their length, the difficulty of the questions, or some other factor. However, it might be suggested that intonation made the meaning clearer or that those reading the review were simply able to more closely scrutinize the questions and detect ambiguities.

The written review and audio review groups also differed significantly at the .05 level in their reactions to feature 26 in Table 11. Those experiencing the audio mode of review found the explanations significantly less interesting than those taking part in the written mode of review. One explanation for this could be that those who had access to all the explanations for all the alternatives

appreciated more the way explanations were shaped to fit the response selected.

Both review groups felt the review was probably worth the time it took (feature 29). However, they both said they enjoyed more watching the televised lecture than responding to the review questions. This could indicate a preference on the subject's part for one modality over another or passive rather than active participation. It could also indicate a preference for instruction over what could be perceived as testing.

c) The data indicate that the users were, on the average, satisfied with the laboratory activities.

As Table 12 indicates, all features of the laboratory activities received positive ratings. The users rated lowest the adequacy with which each point was amplified (feature 12). The lab problem involved transcribing and interpreting 25 reading errors. Since this process was only completed for part of these errors, it may be that the participants in the summer courses, who go through the process for all 25 errors, receive sufficient amplification because of increased replications of the steps in the process. On the other hand, the steps in the process may need to be more explained and interrelated and the value of the exercise for classroom use made more explicit.

The users rated equally low the ability of the laboratory activities to hold their attention (feature 20). It could be that having the subjects begin the experiment after a regular school day was too tiring.

TABLE 12

USER ATTITUDES TOWARD LABORATORY LEARNING ACTIVITY (n=4)

Features	Mean* Response	Standard Error
Technical		
1. Satisfactory listening conditions	4.0	0
2. Appropriate volume on tape recorder presentation	4.25	.25
Presentation		
3. No difficulty seeing items displayed	4.0	0
4. No difficulty hearing lab monitor	4.0	0
5. No difficulty seeing lab monitor	4.25	.25
6. Sufficiently enthusiastic lab monitor	3.75	.25
7. Lab monitor's enunciation clear	4.0	0
8. Not overly simple presentation	4.0	0
9. Not overly complex presentation	4.0	0
10. Appropriate pacing of lab activities	3.5	.5
11. Lab period not too short to cover materials	3.5	.5
12. Review period not too long	3.0	.58
13. Televised lecture not too long	3.75	.25
Content		
14. Lab content well-organized	4.0	0
15. Lab activities cohesive	4.0	0
16. Adequate relating of concepts to examples	4.0	0
17. Sufficient amplification of each point	3.25	.48
18. Material covered not too difficult	4.0	0
19. Material covered not too easy	4.0	0

TABLE 12 -- CONTINUED

Features	Mean* Response	Standard Error
Value		
20. Lab activities capable of holding attention	3.25	.48
21. Learned a great deal during lab	3.5	.5
22. Lab an effective learning activity	3.75	.63
23. Experiment not too long	4.5	.29
24. Preference for TV lecture over lab activities	3.0	.58
25. Preference for review over lab activities	3.25	.98
26. Preference for TV lectures over review	3.0	.58
27. Greater teaching effectiveness of TV lecture over review	4.25	.25
28. Greater teaching effectiveness of TV lecture over lab	3.0	.7
29. Greater teaching effectiveness of lab over review	4.5	.29

*The closer to 5 the more positive the response.

Since the summer course schedule begins at 8:30 A.M. and concludes at 3:30 P.M., unlike the experiment that began at 3:30 P.M. and concluded at 7:00 P.M., the participants should not be as tired when they start. However, since the laboratory period will be longer, there may still be a need to vary the activities in the lab more or revise them in some way to make them more interesting.

d) The data suggest the subjects in group 7 like doing all the learning activities equally well. However, they thought they learned more during some of the activities.

The four subjects who participated in the laboratory activity were the only subjects who received the learning sequence actually followed in the AESP summer courses -- that is, televised lecture, audio review, and laboratory activities. For this reason, they were asked to compare the instructional value of all the learning activities as well as assess the laboratory activities (features 11-13 and 24-29 in Table 12). Since there were only four subjects in this group it would be unwise to place much emphasis in the generalizability of their reactions. All that their responses really tell is how these four subjects felt about the comparative worth of the different instructional activities.

The type of responses made to features 24-26 in Table 12 indicate that these subjects enjoyed almost equally well the learning activities of watching the televised lecture, responding to the review questions, and practicing the skills during the laboratory session. However, their responses to features 27-29 indicate that they felt they

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had learned more from both the TV lecture and the laboratory practice activities than the review questions.

5) Which type of production techniques in the televised lecture best held the interests of the subjects?

Table 13 describes the average reactions of those who responded at 15 points in the televised lecture to the statement "I liked this portion" of the videotape. Since all the means are 3 or higher on a five-point scale, the responses are, on the average, positive. However, interest of varying intensities is sustained throughout the program, with interest highest during the filmed segment depicting Wayne retelling the story (observation 8 in Table 13) and lowest during the close-up shots of the instructor when discussing the assumptions underlying the Reading Miscue Inventory (observation 4). Figure 2 graphically depicts the mean response for each of the 15 points rated during the 31-minute program.

It is necessary when looking at the mean responses in Table 13 to realize that a difference between means of nearly .7 is necessary at the .10 level and over .8 at the .05 level for the difference to be significant. There are, then, only 3 comparisons between adjacent means that are significant at the .05 level: the comparison between observations 4 and 5, 9 and 10, and 13 and 14. The significant difference in interest between observations 4 and 5 parallel the movement of the program from a discussion by the lecturer on the abstract assumptions underlying the RMI to an explanation of the uses of the RMI, punctuated by film showing the RMI in use in a classroom. This supports the idea

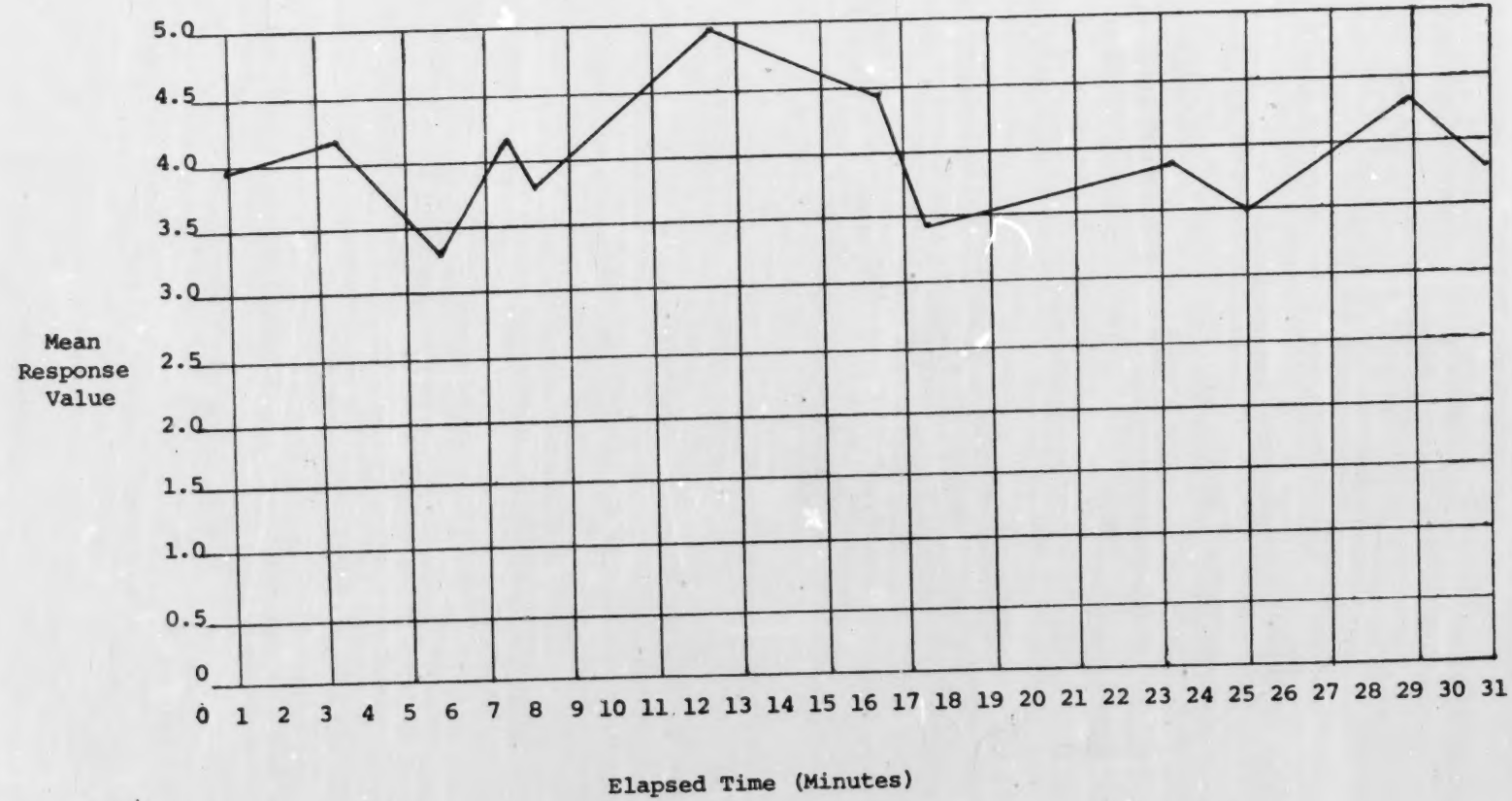
TABLE 13

AUDIENCE REACTION TO TELEVISED LECTURE SEGMENTS

OBS	Time Into Show (Min.)	Segment Time (Min.)	Segment Analyzed	Main Techniques	Mean Response Value	Standard Error
1	00:40	00:40	Open	Documentary film with voice over	4.00	.16
2	3:40	3:00	Introduction	Instructor talking with graphics	4.11	.31
3	5:10	1:30	RMI Manual	Instructor talking with graphics	3.77	.27
4	6:00	00:50	RMI Assumptions	Instructor talking with graphics	3.33	.23
5	7:24	1:29	RMI Use	Instructor talking with graphics & documentary film with sound over	4.11	.20
6	8:15	00:46	Story Outline	Instructor talking with graphics	3.77	.27
7	10:19	2:04	RMI Administration (Wayne reading story)	Documentary film with sound over	4.33	.33
8	12:30	2:11	RMI Administration (Wayne retelling story)	Documentary film with sound over	5.00	.00
9	16:;5	3:45	RMI Analysis	Graphics with voice over	4.44	.24
10	17:35	1:20	Recording Miscues	Graphics & documentary film with voice over	3.55	.29
11	23:39	6:04	Language systems; coding sheet	Instructor talking with graphics & documentary film with voice over	3.66	.37
12	26:17	2:38	Pattern of comprehension	Documentary film with voice over & instructor talking with graphics	3.88	.20
13	27:21	1:04	Reading Profile Sheet	Graphics & documentary film with voice over	3.66	.23
14	30:30	3:09	Miscues - Natural; Closing Statements	Instructor talking with graphics	4.33	.16
15	31:15	00:45	Close	Documentary film with voice over	3.88	.11

FIGURE 2

GRAPH OF AUDIENCE REACTION TO TELEVISED LECTURE #5
MISCUE ANALYSIS



that teachers are interested in knowledge for which they can see an immediate practical use.

The significant difference in interest between observations 9 and 10 may result more from the gradual loss of interest as the focus shifted from the child actually reading and retelling the story (observations 7 and 8) to the mechanics of analyzing the miscues made by the child. It might be expected that teachers would find a real student more interesting than abstract systems, even if the purpose of these systems is to help the child.

The significant difference in interest between observations 13 and 14 may be the result of the same kind of influence that made observation 8 higher than observation 9. Focusing on the problems a child has (observation 7) and what to do about them (observation 13) is probably more anxiety producing and far less delightful than listening to a child retell a story (observation 8) or being reassured that miscues are natural (observation 14).

Mean responses on the audience reaction scale for the televised lecture were computed for four general categories of presentation. The categories were (a) the opening and closing segments (observations 1 and 15); (b) the early instruction presentations (observations 2-6); (c) the child's (Wayne) reading and retelling of the story (observations 7 and 8), and (d) the subsequent presentations by the instructor (observations 9-14). The means for these composites were (1) 4.67 for Wayne reading; (2) 3.94 for the opening-closing segment; (3) 3.93 for the later discussion segment, and (4) 3.74 for the early presentation.

Significant tests were run for all possible pairwise comparisons

among the means of these four presentation categories, in order to find out if there was a difference in audience interest between any of the segments. There was a significant difference at the .05 level between Wayne reading and either the opening and closing, the early discussion, or the late discussion segments. Focusing on the individual student proved to be significantly more interesting to the teachers than any of the presentation format combinations used in the other three time segments: graphics, focusing on the lecturer, close-ups of materials used or the film montage for the opening and closing.

6) How does what the subjects perceived was covered compare with what the instructor intended to emphasize?

The subjects were given a list of the 7 unit objectives listed in random order with three bogus objectives and asked to rank all 10 objectives in terms of the perceived emphasis they felt each objective received during the instruction. The reading course instructor also was asked to look at the 10 objectives and rank them in terms of their importance. To determine the level of agreement between the instructor's and the student's ordering of objectives, a Spearmam rank-order correlation coefficient was computed. The estimated coefficient of correlation was .73. This value is significant at the .05 level. This means that there was substantial agreement between the intended and perceived importance given each objective.

Table 14 lists the order the developer of the instructional unit and the users of the unit assigned the objectives. The objectives are identified in Table 2, objective 1 in Table 14 corresponding to objective

1 in Table 2. As revealed in Table 14, the major discrepancies involved objectives 1, 2, 4, and 5, that focus on the cognitive functions of Knowledge, Application and Interpretation. The instructor apparently did not mean to emphasize the lower cognitive function of knowledge as much as the higher cognitive functions of application and interpretation. Consequently, the revision of Unit 5 probably might entail giving greater emphasis to the objectives involving higher cognitive processes.

TABLE 14

INTENDED-PERCEIVED EMPHASIS OF OBJECTIVES

Objective #	Cognitive Level	Intended Order of Emphasis	Perceived Order of Emphasis	Mean Ranking	Standard Error
1	Knowledge	4	2	4.58	.43
2	Knowledge	5	1	4.36	.38
3	Application	3	3	4.67	.40
4	Application	1	5	4.81	.41
5	Interpretation	2	4	4.72	.60
6	Application	6	6	4.83	.33
7	Application	10	10	7.58	.46
B_1		8	7	5.81	.49
B_2		9	8	6.31	.45
B_3		7	9	7.25	.48

Spearman's $\rho = .73$ for the two sets of ranks. This value is significant at the .05 level.

*Table 2 lists the objectives for Unit 5.

7) Is there a need to make any alterations in the evaluation procedures or instruments?

The 7-group formative evaluation design provided an opportunity to try out the instructional and evaluative materials, procedures and equipment for the DPRI reading course. The following observations made as a result of this study had considerable value to those developing the evaluative products.

a) The time allotted for administration of the evaluation instruments was too long.

Table 15 lists the average time it took the groups to complete each instrument and the amount of time scheduled for the administration of each instrument. With the empirical knowledge gained from going through the evaluative and instructional activities for one unit, the RCC Evaluation Component was able to estimate more realistic time allotments for the administration of evaluation instruments for summer courses.

b) Item analyses performed on the multiple-choice items on the unit test and the audio review identified non-functioning distractors and non-discriminating items.

Table 16 shows the number of subjects in the audio and written review groups who chose each alternative for the four audio review questions. The percentage of the subjects choosing the correct response

TABLE 15

ADMINISTRATION TIMES FOR INSTRUMENTS

Instrument	Allotted Time	Average Completion Time
Unit Test #5	20 min.	14 min.
Reading Attitudes Test	20 min.	9 min.
Unit Objective Rating Form	15 min.	7 min.
Confidential Background Questionnaire	15 min.	7 min.
Video Questionnaire	20 min.	6 min.
Lecture Questionnaire	20 min.	8 min.
Script Questionnaire	20 min.	6 min.
Four-Channel Audio Rating Form	15 min.	5 min.
Four-Channel Audio Script Rating Form	15 min.	2 min.
Ancillary Activities Questionnaire	20 min.	9 min.

for each of the questions ranged from 29% for item four to 93% for item one. Since 93% of the group answered item one correctly, the concept apparently gave most of the subjects little trouble. What should be done depends on what the purpose of the review is. However, if the review is supposed to reinforce conceptually difficult ideas covered during the lecture, then items that deal with concepts that most of the subjects had no trouble with should be replaced with other items.

The distribution of the responses among the four alternatives shows that some of the audio review distractors are not functioning.

TABLE 16

SUMMARY OF RESPONSES TO REVIEW QUESTIONS

Question #	Student Response* a	b	c	d	Percent Correct	Correct Response
1	0	13	0	1	93	b
2	5	0	8	1	57	c
3	0	1	3	10	71	d
4	0	4	0	9	29	b

*Sample size = 14, Groups 5 and 6.

None of the subjects selected alternatives a and c in items 1 and 4, b in item 2, or a in item 3. Non-functioning distractors probably need to be made more attractive by focusing on aspects of the problem that can be confusing, unless obviously wrong alternatives contain a notion so wrong that the absurdity needs to be emphasized. When immediate feedback follows a response it would seem that all the distractors should be made as attractive as possible.

In Tables 17 and 18 are listed the item analysis results for the unit test items. These indices indicate that the test was relatively easy. Test reliability for the control group was .703 by KR-20, the test mean was 12.89 and the test standard deviation was 3.30. For treatment groups 2-7, test reliability was .395 by KR-20, the test mean was 16.06 and the test standard deviation was 2.24. The reliability estimates are computed with items having easiness indices of 1.00 removed.

TABLE 17

ITEM ANALYSIS FOR UNIT TEST

OBS.	Test Item #	Objective	Group 1[1.] Easiness	Group 1[1.] SD	Groups 2-7[2.] Easiness	Groups 2-7[2.] SD
1	1	4	.111	.31	.194	.40
2	2	2	.667	.47	.871	.34
3	3	2	.111	.31	.871	.34
4	4	3	.667	.47	.968	.18
5	5	3	1.000	.00	.871	.34
6	6	6	.778	.42	.742	.44
7	7	5	.889	.31	.968	.18
8	8	4	.333	.47	.516	.50
9	9	7	.000	.00	.161	.37
10	10	5	.444	.50	.581	.49
11	11	6	.000	.00	.161	.37
12	12a	3	1.000	.00	1.000	.00
13	12b	3	1.000	.00	.968	.18
14	12c	3	.667	.47	.903	.30
15	12d	3	.667	.47	.903	.30
16	13	1	.667	.47	.548	.50
17	14	7	.556	.50	.290	.45
18	15	1	.667	.47	.677	.47
19	16	6	.778	.42	1.000	.00
20	17	7	.444	.50	.548	.50
21	18	5	.889	.31	.968	.18
22	19	1	.444	.50	.581	.49
23	20	4	.889	.31	.839	.37
24	21	2	.222	.42	.935	.25

In Table 18 the frequency with which each alternative was selected is given. Finding out which items were not discriminating and which distractions not functioning led to the revision or elimination of unit test items used during the summer DPRI course.

c) Generally the directions to the class coordinator and the subjects were clear, but points where misunderstanding could occur were identified.

TABLE 18

ITEM RESPONSE FREQUENCY FOR UNIT TEST

OBS.	Test Item #	Objective	Proportion Choosing Alternative #							
			Group 1				Groups 2-7			
			1	2	3	4	1	2	3	4
1	1	4	.111	.222	.333	.333	.194	.419	.355	.032
2	2	2	.111	.667	.000	.222	.065	.811	.000	.065
3	3	2	.222	.111	.111	.556	.000	.032	.871	.097
4	4	3	.111	.222	.667	.000	.032	.000	.968	.000
5	5	3	.000	.000	.000	1.000	.065	.000	.065	.871
6	6	6	.000	.000	.222	.778	.000	.032	.226	.742
7	7	5	.111	.889	.000	.000	.000	.968	.000	.032
8	8	4	.333	.333	.111	.222	.161	.516	.290	.032
9	9	7	.333	.222	.000	.444	.047	.194	.161	.548
10	10	5	.222	.444	.000	.333	.355	.581	.000	.032
11	11	6	.111	.000	.000	.889	.065	.161	.161	.613
12	12a	3	1.000	.000	.000	.000	1.000	.000	.000	.000
13	12b	3	.000	.000	.000	1.000	.000	.032	.000	.968
14	12c	3	.000	.667	.333	.000	.000	.903	.097	.000
15	12d	3	.000	.333	.667	.000	.065	.032	.903	.000
16	13	1	.333	.000	.000	.667	.129	.226	.097	.548
17	14	7	.000	.444	.556	.000	.000	.516	.240	.194
18	15	1	.222	.111	.000	.667	.258	.065	.000	.677
19	16	6	.222	.778	.000	.000	.000	1.000	.000	.000
20	17	7	.333	.000	.444	.222	.323	.000	.548	.129
21	18	5	.000	.889	.000	.111	.000	.968	.032	.000
22	19	1	.556	.000	.000	.444	.419	.000	.000	.581
23	20	4	.000	.000	.889	.000	.097	.000	.839	.032
24	21	2	.222	.111	.000	.667	.435	.000	.000	.065

Trying out the instruments revealed many of the questions site coordinators would need to know how to answer during the course. For instance, on the Confidential Background Questionnaire the subjects wanted to know whether they should guess their GRE scores or leave the space blank, whether they should count reading courses they were currently enrolled in as reading courses completed, why they had to put any identifying information on the instruments. Knowledge of some of the problems that were likely to arise showed the RCC Evaluation Component where to amplify the directions to the students and which administration details needed to be included in the site monitor's manual.

SUMMARY

What are some of the tentative conclusions that can be drawn from this study on one reading unit?

The formative evaluation designs in this study identify some of the strategies that could be implemented to secure information useful in product development. The study included audience reaction polling and grouping by treatments, with the treatments involving varying the amount of the learning sequence received or altering formats of the different learning activities.

Regardless of which stragegies are adopted, some kind of formative evaluation study should be carried out on each instructional unit. In-process evaluation studies like these enable the producers of

instructional materials to obtain information they can use to improve their products before they are finalized. In addition, feedback on one unit often helps producers shape other units more effectively. Although limited time and funding made extensive formative evaluation impossible for the 1974 AESP summer courses, greater involvement of the RCC Evaluation Component in product development should result in the production of better materials.

To summarize the findings of this study, the data indicated that instruction involving at least the initial learning activity in the unit prepared the subjects to perform better the behaviors specified for the unit. However, gains in performance were not detected for additional learning activities in the sequence. This may mean that activities subsequent to the televised lecture simply repeat former coverage, rather than prepare the subject to perform higher cognitive behaviors. Since no tests were given after the lapse of a substantial amount of time, however, it is impossible to say whether the additional learning activities in the sequence increased long-term retention of the material.

The data indicated that the subjects preferred situation-centered handling of concepts to abstract discussions about them. The responses during the audience-reaction study suggested that the subjects preferred discussions of issues immediately relevant to them as classroom teachers. They seemed to like visuals showing actual classroom situations more than watching the lecturer. Consequently,

whenever possible it might be a good idea to explain concepts and procedures through the construction of actual or fabricated situations that demonstrate them.

Are there ways to improve future implementations of these formative evaluation models?

This piloting of both the 7-group and audience-reaction studies identified several ways the designs could be improved. First, the sample size per group should be increased, since the larger the sample the more sensitive the analysis is to differences in the effectiveness and acceptability of the different learning materials and activities. This could involve running the study on a larger sample. Given the availability of experimental subjects, however, a more practical solution would be to run studies of smaller scope with samples of about this size (40). For instance, audience reaction studies could be run on each of the televised lectures, and the subjects asked at selected points in the program whether they liked it, understood what was going on, or any other dichotomous question.

Secondly, to make the results generalizable to the target population, subjects as near as possible like the prospective users of the course should be selected to participate in the evaluation studies. For instance, the subjects in this study tended to be inexperienced teachers. If the future participants in the course are experienced teachers, the results may not be very informative about how they would respond to the products. However, correlational analyses revealed that

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for the subjects who participated in this study neither the number of previous reading courses taken or undergraduate or graduate grade-point-average was significantly correlated with performance on the unit test.

Thirdly, if at all possible the unit tests should be more thoroughly piloted before being used to measure differences. While the reliability of unit test 5 may be high enough to be acceptable for research purposes, care always should be taken to make sure that unit tests are sensitive enough to pick up subtle differences in the ability of the subjects to perform higher level cognitive functions.

Finally, since the on-site course coordinators in the field are not experts in reading instruction, the person selected to run the laboratory session during the experiment also should not be a content expert. In this study the lab monitor was the person who developed the program. It would be better to have a person as nearly like field respresentatives as possible, if the appropriate effect of the lab activities is to be found and if the directions are going to be checked to determine whether the procedures are clearly enough spelled out for a non-expert to handle questions that arise.

The 7-group formative evaluation design provided an opportunity to try out some of the instructional and evaluative materials, procedures, and equipment used in the DPRI reading course. With such a small number of subjects going through only one unit, it would obviously not be valid to take their reactions as the final word. However, their responses identified for course developers potential problem areas.

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